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Acute sugary drink induces micro- and macrovascular dysfunction even in healthy young human: a randomized cross-over study

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Overconsumption of sugary drinks has recently been implicated in the pathogenesis of cardiovascular disease. Our objective was to elucidate acute hemodynamic and nitric oxide (NO)- related micro- and macrovascular responses to the ingestion of a commercial sugary drink containing sucrose or tap water with or without sucrose at a similar concentration to that found in commercial soft drinks.

In a randomized cross-over study design, 12 young healthy males ingested 600ml of the 1) commercial sugary drink (Solo Lemon®, Schweppes, Australia) containing 72,4g of sucrose (SD), 2) tap water with dissolved 72,4g of sucrose (TWS) and 3) tap water (TW). Blood glucose, blood pressure and heart rate were monitored during the protocol. Additionally, vascular endothelial function testing was performed during the blood glycaemia peak, 15min after drink ingestion, including NO microvascular (cutaneous blood flow measured by laser Speckle contrast imaging in response to iontophoresis of acetylcholine and sodium nitroprusside), and macrovascular reactivity (flow-mediated dilation and nitrate-mediated dilation).

Blood glucose increased significantly and by a similar magnitude during SD and TWS compared with baseline measure and the TW trial. SD, TWS and TW did not increase blood pressure during the various trials, and heart rate did not change, except at the end of TWS testing. Micro- and macrovascular endothelial function after SD were compromised compared to TW. Unpredictably, TWS induced only macrovascular dysfunction, with no changes in microvascular function compared to SD. Smooth muscle cell function was unaltered, independent of drinks.

Collectively, the results demonstrated that SD-induced acute hyperglycemia can lead to NO-related endothelial dysfunction in micro- as well as in macrovascular beds. However, since TW with the same dose of sucrose compared with SD induced only macrovascular dysfunction, the effects of other ingredients (food acids, preservative, flavor…) present in SD on microcirculation can be questioned.